

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/23175

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : F16F 1/34,1/36; F16M 13/00; B62D 23/00
 US CL : 403/2,220,223; 267/140,140.12,154,292,293,294; 411/437,525,526,527

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 U.S. : 403/2,220,223; 267/140.12,154,292,293,294

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| X | US 5,580,028 A (TOMCZAK) 3 December 1996 (03.12.1996), col.3, lines 1-38. | 1,2,8 and 10 |
| X | US 4,032,202 A (ISHIKAWA) 28 June 1977 (28.06.1977), col. 4, lines 3-30. | 1 and 2 |
| Y | US 4,588,174 A (KONISHI) 13 May 1986 (13.05.1986), entire document. | 1-6,8,9 and 12-18 |
| Y | US 3,036,793 A (Becker) 29 May 1962 (29..05.1962), entire document | 7 and 11 |
| Y | US 5,195,860 A 23 March 1993 (23.03.1993), col. 3, lines 47-57. | 7 and 11 |
| Y | US 6,705,813 A (Schwab) 16 March 2004 (16.03.2004), col. 4, lines 2-8. | 7 and 11 |
| A | US 4,685,531 A (KOPICH) 11 August 1987 (11.08.1987). | 1 |
| A | US 5,577,854 A (JACOB) 26 November 1996 (26.11.1996). | 1, 2 and 8 |
| A | US 4,720,075 A (PETERSON) 19 January 1988 (19.01.1988). | 1 |

Further documents are listed in the continuation of Box C. See patent family annex.

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|---|-----|--|
| * Special categories of cited documents: | "T" | later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention |
| "A" document defining the general state of the art which is not considered to be of particular relevance | "X" | document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone |
| "R" earlier application or patent published on or after the international filing date | "Y" | document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
| "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | "&" | document member of the same patent family |
| "O" document referring to an oral disclosure, use, exhibition or other means | | |
| "P" document published prior to the international filing date but later than the priority date claimed | | |

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|---|--|
| Date of the actual completion of the international search | Date of mailing of the international search report |
| 25 March 2004 (25.03.2004) | 10 JUN 2004 |
| Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230 | Authorized officer Lynne H Browne <i>Lynne H Browne</i> Telephone No. 703-308-2168 |

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INTERNATIONAL SEARCH REPORT

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| A | US 4,706,947 A (MAKIBAYASHI) 17 November 1987 (17.11.1987). | 1, 2, 8 and 10 |
| A | JP 607,427 A (ORIKAWA) 15 March 1994 (15.03.1994). | 1 |